DRAFT SUPPLEMENT:

ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED MONTANA POWER COMPANY ELECTRICAL GENERATING PLANT AT COLSTRIP, MONTANA

December, 1972

Department of Health and Environmental Sciences
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INTRODUCTION

This supplement was written upon recommendation of the Montana Environmental Quality Council. The recommendation was made in view of pertinent information that became available following publication of the draft. Publication of this supplement will not affect the timetable for publication of the final statement. Letters and other material will be accepted for inclusion in the final statement until January 20.

A. Emissions and Effects

1. Fluorides

The State has learned that fluoride levels in the coal at Colstrip are higher than reported in the draft statement. Higher levels of fluoride in the coal will lead to higher emission rates of fluoride compounds into the air, although violation of the state ambient air quality standard seems unlikely.

The emission rate of fluorides into the atmosphere will be partially determined by the amount of fluorine in the coal, the rate the coal is burned, the percentage of the fluoride that leaves the boiler in the flue gases, and the efficiency of the wet scrubbers in removing the fluorides.

Venturi scrubbers apparently are efficient removers of fluorides. Stauffer Chemical Company reports that the venturi scrubber used at their Ramsey plant removes about 97 percent of the predominantly gaseous fluorides from the emissions. It seems reasonable to expect that the venturi scrubbers planned for Colstrip should be about as efficient. Particulate fluorides will be removed at about the same efficiency as other particulates, over 99 percent.

Considering the fluoride concentrations analyzed in Montana coal, as shown in table 1, we can devise a situation to show the worst possible pollution episode with fluorides from the proposed plant. First we assume the fluoride concentrations in the coal to be 150 ppm, dry weight basis, higher than any concentrations found in the coal. We then assume further that none of the fluoride in the coal remains in the boiler bottom ash, that the scrubbers are only 90 percent efficient with fluorides, and the maximum coal consumption rate is 585,300 pounds per hour, dry weight, as predicted.

Table 1

FLUORINE ANALYSES OF MONTANA COALS
(ppm F Dry Weight)

Sample No. Seam/Location	Dept. of Health Laboratory Method 1	Method 2	Method 3	Univ. of Montana	USGS	Ill. Geol. Sur.	CT & E
C6-1 Rosebud/Colstrip	45.1 47.0	44.5	39	62	140		
C6-2 Rosebud/Colstrip	42.3 42.3	39.0	44	58	140		
C6-3 Rosebud/Colstrip	31.0 27.4	31.0	40	44	120		
C6-4 Rosebud/Colstrip	27.1 32.9	27.0	27	50	110		
Rosebud-McKay/ Sarpy Creek							120
Robinson/ Sarpy Creek							70
Seam Unknown/ Peabody Mine, Colstrip						93	

Using these pessimistic figures, we are able to calculate a fluoride emission rate of 1.10 gm/sec. Applying this rate to the diffusion model indicates that under the worst possible meteorological conditions, the fluoride concentration in the ambient air would reach a maximum 24-hour average of 0.084 ppb. This level is well within the ambient air quality standard of 1.0 ppb for a 24-hour average. Use of more realistic figures in the calculations would indicate lower levels of fluoride emissions.

If we assume the more likely concentration of 75 ppm fluoride in the coal, 98 percent scrubber efficiency, with less than all of the fluoride leaving the boiler in the flue gases, and maximum coal consumption, we can predict fluoride emissions of less than 0.11 gm/sec into the air. At this rate the worst possible meteorological conditions would produce a 24-hour fluoride comcentration of less than .008 ppb.

2. Sulfur Oxides

The maximum concentration estimate of .43 ppm predicted in the draft statement has been reduced, following refinement of the dispersion model, and taking into consideration new meteorological information. The most recent estimates predict SO_2 concentrations will not exceed .136 ppm, even under the most severe fumigation conditions thought possible. The Montana standard requires that .25 ppm SO_2 for one hour not be exceeded more than once every four days. The ambient air standard could only be violated if fumigation were to occur in the same area with the same wind direction and the same adverse weather conditions more than once within four days. Such unusual conditions are highly unlikely.

Nevertheless, the state's experience in monitoring ambient air near other industrial complexes indicates that violations do occasionally occur under adverse weather conditions. Wind channeling and impingement must be considered as possible contributors to higher ambient levels than ordinarily would occur. It should be noted also that the model used for estimating

downwind condentrations is expected to be accurate only within a factor of two. Thus the levels predicted could be half or twice actual levels.

The state's dispersion model uses techniques outlined in the Workbook of Atmospheric Dispersion Estimates[1], and Principal Plume Dispersion Models.[2]

Estimates for fluorides, particulates, and oxides of nitrogen were made by multiplying the SO_2 results by the respective ratios of SO_2 emission to fluoride, particulates and nitrogen oxides.

A different model of similar design was used by the Environmental Protection Agency in Denver to estimate annual levels, as indicated in Table 2. No violation of the annual standards is indicated.

TABLE 2

MAXIMUM GROUND LEVEL CONCENTRATIONS FOR TWO 350 MEGAWATT UNITS

Period / Pollutants	10 min.	1 hour	3 hour	24 hour	Annual
Particulates (ug/m^3)	-	-	-	2.0	0.10*
Sulfur Oxides ppm	0.18	0.14	0.11	0.02	0.001*
Nitrogen Oxides ppm as NO_2	-	-	-	0.02	0.001*
Fluorides (PPB)	.776	.60	.47	.084	.005

*EPA Diffusion Model

[1]Turner, D. Bruce. Workbook of Atmospheric Dispersion Estimates. PHS Publ. No. 999-AP-26. 1967.

[2]Principal Plume Dispersion Models, TVA Power Plants. Carpenter, S.B., and others. Tennessee Valley Authority, Muscle Shoals. Journal of the APCA, August, 1971, Vol. 21, No. 8.

3. Effects on ecosystem

The effects of most air pollutants on rangeland are largely unknown, although damage to plants and animals by airborne fluorides has been well documented. Fluorides in vegetation are known to harm animals when the concentration is 35 ppm or higher. Airborne fluorides from the proposed Colstrip plant are expected to range between .776 and .005 ppb, far less than the amount calculated to cause dangerous concentrations in plants.

However, since fluoride damage results primarily from the long term absorption of small amounts, there is no sure method of predicting damage to the Ponderosa Pine over the expected 30 year life of the generator plant. It should be noted that the Northern Cheyenne Indian Reservation, about 17 miles south of Colstrip, has 217,682,000 board feet of standing commercial Ponderosa Pine timber. Projected sales of the timber are 6,000,000 board feet a year for the next 25 years. Directly east of the reservation is a unit of the Custer National Forest, which also has substantial pine resources.

Plant damage by sulfur dioxide has been studied at considerable length, althougn no specific studies concerning rangeland plants of the types around Colstrip are known. It is known that alfalfa is one of the most sensitive of all plant species to SO_2.

Existing studies indicate that SO_2 emitted by the proposed plant should not reach concentrations high enough to damage nearby alfalfa.

Less certain is the effect of SO_2 in mixture with other pollutants. Data on synergistic reactions is scarce and there is none to indicate that combined pollutants in the concentrations expected from the proposed power plant would damage vegetation.

SO_2 may react with water in the atmosphere to form sulfuric acid mist. The dry climate and large vertical difference between the discharge levels of SO_2 from the 500-foot stacks and water vapor from the low level cooling towers is expected to prevent significant generation of acid mist.

4. Human Health

Air pollutants at certain concentrations are known to be harmful to human health. A Billings allergist has noted in correspondence to the state that temperature inversions trapping emissions from pollution sources in and near the city cause serious worsening in the conditions of many of his patients suffering respiratory ailments. SO_2 is chief among pollutants damaging to respiratory patients. Monitoring in the Billings vicinity during inversions in August and September, 1972, indicated SO_2 levels ranging from .45 to 1.26 ppm, substantially above what is predicted for the Colstrip area. Whether fine particulates from the proposed Colstrip plant would attain sufficient levels to endanger health is unknown.

Impacts Other Than Emissions

A. Water Use

It is impossible to determine the impact of water appropriation from the Yellowstone River until the actual volume to be used is known. The applicant has told the state that the pipeline will be 22 to 26 inches in diameter (see attached letter). However, documents dated December 22, 1970, and filed in the Rosebud County Courthouse in Forsyth record that the applicant has appropriated 250 cubic feet a second, to be transported through a 60-inch pipeline. The applicant indicates the large appropriation was made because at the time it was uncertain how much water was to be needed.

Also unavailable is information on the route of the pipeline. The applicant has told the state that the exact route and point of withdrawal are unknown. Other records at Forsyth indicate that when the appropriation was filed, the applicant expected to complete preliminary surveys of the pipeline route in 1971, and final surveys and land acquisition in 1972. Installation of the pipe and pumps was scheduled for 1974.

If the applicant were to use the full 250 cfs appropriated, it could have a serious effect on the Yellowstone River below the outlet, as noted in Table 3.

It should be noted that figures supplied by the Environmental Defense Fund show that 250 cfs should supply a sustained generation capacity of 9,875 megawatts. For comparison, a 24-inch pipe supplying 40.1 cfs would sustain generation of up to 1,590 megawatts. Although the applicant has disclosed no plans for more than 700 megawatts of generating capacity at Colstrip, officials of the Bonneville Power Administration have stated publicly that the applicant is considering construction of two 700-megawatt generators in addition to the development now proposed. The officials said the two additional plants would be expected to go on line in September, 1978, and September, 1979. To get the plants operable by that time, it was indicated, a decision to build would be necessary early in 1973. Such construction would require more water than could be transported in a 26-inch line.

Under Montana law, any water appropriated but not used may be appropriated by another user. Thus, if the applicant does not use the full 250 cfs, it may be appropriated by another consumer.

As noted in the attached letter from the applicant, there is considerable interest in the possible construction of units three and four. The applicant has indicated that if the decision is made to build these additional units, reapplication would be made to the state, considering the increased scope of the operation.

It should be noted that the latest information from the applicant indicates the pipeline will intersect the Yellowstone River either at Forsyth or Nichols.

TABLE 3

STATION	DRAINAGE AREA, Mi^2	MAX. FLOW, cfs	MIN. FLOW cfs	AVG. FLOW cfs
Yellowstone at Billings	11,795	66,100	430	6,754
Bighorn at Bighorn	22,885	26,200	275	3,756
Tongue at Miles City	5,379	13,300	0	405
Yellowstone at Miles City	48,253	96,300	996	11,140
Powder near Locate	13,194	31,000	0	600
Yellowstone near Sidney	69,103	159,000	470	12,910

Records show that between 1931 and 1965 the lowest daily flows of the Yellowstone River at Miles City averaged 1900 cfs. During these low water periods the flow of the Tongue River and Rosebud Creek is nil or nearly so. Therefore,

low flows at Forsyth also should average 1900 cfs. Thus, 250 cfs at Forsyth would represent about one-eighth of the river's total low flow in an average year.

Alternatives to Proposed Construction

A. Dry Cooling Towers

According to the North Central Power Study (Volume 1, page 13) increased operating and maintenance costs of dry cooling facilities would amount to less than 1/250th of a cent per kilowatt hour of electrical energy generated. Construction of dry cooling facilities is expected to increase capital costs by about ten percent, or $14.00 per kilowatt of generating capacity. Dry cooling for the proposed 700-megawatt facility thus would increase capital costs by $9.8 million. Dry cooling for the entire 53,000 megawatt capacity proposed by the NCPS would increase costs $742 million.

Although high, the latter figure is $100 million less than half the $1.7 billion the Bureau of Reclamation has estimated for construction of the Montana-Wyoming aqueduct system. This system, using dams and diversions, is proposed to supply water for coal related development in the Gillette-Colstrip area.

The question, therefore, is whether the long run high cost of wet cooling will be borne by the taxpayer, or whether the lower cost of dry cooling will be borne by the consumer. Hidden costs, including the loss of the water for other purposes, such as recreation and agriculture, also must be considered.

No large air cooled generating plant is now operating, although a 20-megawatt air cooled plant is operating in Gillette, with a 330-megawatt unit, also air cooled, planned for the same site, according to the Environmental Defense Fund.

B. Powerlines

The applicant is in the process of completing a 230 kv line from Billings to Colstrip via Hardin. The line will furnish power to Colstrip until the proposed units begin operation. As noted in the applicant's attached letter, two other 230 kv lines are planned to run north of the Yellowstone River to join a new substation north of Billings. Lines from the substation then would plug into the existing

power network. Bonneville Power officials have stated publicly that no new lines will be needed from Billings to load centers in the Pacific Northwest unless or until unit four of the Colstrip development goes on line, possibly in September of 1979. If unit four is built, according to the officials, a new line, probably 500 kv, would be needed, possibly through the Magruder Corridor.

Also, the applicant is known to be contemplating a new line from Billings to Great Falls, through Judith Gap. It is not known whether this line is related to the Colstrip development.

Power Use

Little is known of the use to be made of the power shipped out of Montana except that it would be delivered to load centers in the highly industrialized Pacific Northwest. One significant user of power in the area is aluminum refineries, located in the Northwest to take advantage of low cost electricity.

The Anaconda Aluminum Plant now operating at Columbia Falls uses 345 megawatts, over one-third of all power now generated in Montana.

The applicant indicates that half of the 700 megawatt generating capacity proposed would be reserved for eventual use in Montana. BPA officials have stated further that 25 percent of the combined 1400 MW capacity of the contemplated generating units three and four at Colstrip would stay in Montana, with the remainder to go to the Northwest.

The MONTANA POWER COMPANY

GENERAL OFFICES
ELECTRIC BUILDING
BUTTE, MONTANA 59701

December 29, 1972

Mr. Don Holtz
Chief, Air Quality Bureau
Department of Health and
Environmental Sciences
State of Montana
Helena, Montana 59601

Dear Mr. Holtz:

With reference to our past conversations, I would like to summarize the present status of The Montana Power Company's planned electric transmission and water system portions of the Colstrip project. That project as described in our application to your Department for a Construction Permit to install equipment which may contribute to air pollution and to install air pollution control equipment is two 350 MW generating units. With that generating capacity, the following facilities will be required:

Electric Transmission Lines

The partially completed Billings-Hardin-Colstrip 230 kV line will be completed. That line is presently completed from Billings to Hardin, and most of the right of way from Hardin to Colstrip has been secured. This line will be completed in 1973 and will be used to supply power to the Colstrip area until the Colstrip generation is on-line.

In addition to that line, two 230 kV lines from Colstrip to Billings will be required to bring the Colstrip generation into the existing MPCo system. Those lines will be required, one in 1975 and one in 1976. Their route has not yet been detailed, but presently it is assumed that generally they will be north of the Yellowstone River valley and will connect to MPCo's existing system at a new switchyard to be located north of Billings.

The existing MPCo electric transmission system is continually expanding to meet the increasing energy requirements of its customers. Generating capacity introduced into the system at Billings will change the system flow patterns and may change the timing of system additions. Such additions may be influenced by the Colstrip project, but are not an integral part of that project.

Water System

The proposed two 350 MW units will require approximately 8,000 acre-feet/year of water, at rates up to a maximum of 8,000 gpm. The water will come from the Yellowstone River at either Nichols or Forsyth, depending on the pipeline route selected. Two potential routes currently being evaluated are from Nichols up Armells Creek valley, and from Forsyth over the benchland between Armells and Rosebud valleys. The pipeline size will be in the range of 22" - 26" OD, depending on the length of the route selected.

The design of those particular facilities is still flexible, and of course, the best planning maintains the maximum flexibility for as long as possible. The greater the flexibility, the more options remain open so that the final plan will have been adjusted to accommodate the latest technology, including all environmental considerations.

Additional generating capacity at the Colstrip site is a potential change that would affect these facilities. There has been discussion and interest shown by utilities in the northwest for this additional generation. No commitments have been made but the discussions continue. If a commitment is made soon enough, significant economies could be realized by enlarging the initial water pipeline rather than having to install a second line which would also have great environmental advantages. The same would apply to the transmission lines.

Be assured that if changes materialize before a permit is granted, the Department of Health and Environmental Sciences will be notified immediately and a new application submitted for permission to construct any new equipment capable of emitting any contaminants to the atmosphere.

Sincerely,

Carl R. Anderson

Carl R. Anderson, Manager
Environmental Protection Department

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